

(2) Flight training in each appropriate maneuver or procedure required for initial flight training in the airplane unless the Administrator finds that particular maneuvers or procedures are not necessary.

(3) The number of programmed hours of ground and flight training determined by the Administrator to be necessary for the airplane, the operation, and the crewmember or aircraft dispatcher involved.

Differences training for all variations of a particular type airplane may be included in initial, transition, upgrade, and recurrent training for the airplane.

§ 121.419 Pilots and flight engineers: Initial, transition, and upgrade ground training.

(a) Initial, transition, and upgrade ground training for pilots and flight engineers must include instruction in at least the following as applicable to their assigned duties:

- (1) General subjects—
 - (i) The certificate holder's dispatch or flight release procedures;
 - (ii) Principles and methods for determining weight and balance, and runway limitations for takeoff and landing;
 - (iii) Enough meteorology to insure a practical knowledge of weather phenomena, including the principles of frontal systems, icing, fog, thunderstorms, and high altitude weather situations;
 - (iv) Air traffic control systems, procedures, and phraseology;
 - (v) Navigation and the use of navigation aids, including instrument approach procedures;
 - (vi) Normal and emergency communication procedures;
 - (vii) Visual cues prior to and during descent below DH or MDA;
 - (viii) Approved crew resource management initial training; and
 - (ix) Other instructions as necessary to ensure his competence.
- (2) For each airplane type—
 - (i) A general description;
 - (ii) Performance characteristics;
 - (iii) Engines and propellers;
 - (iv) Major components;
 - (v) Major airplane systems (i.e., flight controls, electrical, hydraulic); other systems as appropriate; prin-

ciples of normal, abnormal, and emergency operations; appropriate procedures and limitations;

- (vi) Procedures for—
 - (A) Recognizing and avoiding severe weather situations;
 - (B) Escaping from severe weather situations, in case of inadvertent encounters, including low-altitude windshear, and
 - (C) Operating in or near thunderstorms (including best penetrating altitudes), turbulent air (including clear air turbulence), icing, hail, and other potentially hazardous meteorological conditions;
- (vii) Operating limitations;
- (viii) Fuel consumption and cruise control;
- (ix) Flight planning;
- (x) Each normal and emergency procedure; and
- (xi) The approved Airplane Flight Manual.

(b) Initial ground training for pilots and flight engineers must consist of at least the following programmed hours of instruction in the required subjects specified in paragraph (a) of this section and in § 121.415(a) unless reduced under § 121.405:

- (1) Group I airplanes—
 - (i) Reciprocating powered, 64 hours; and
 - (ii) Turbopropeller powered, 80 hours.
- (2) Group II airplanes, 120 hours.

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§ 121.420 Flight navigators: Initial and transition ground training.

(a) Initial and transition ground training for flight navigators must include instruction in the subjects specified in § 121.419(a) as appropriate to his assigned duties and responsibilities and in the following with respect to the particular type airplane:

- (1) Limitations on climb, cruise, and descent speeds.
- (2) Each item of navigational equipment installed including appropriate radio, radar, and other electronic equipment.
- (3) Airplane performance.